

Mid-term exam (November 14, Monday) will cover the following materials.  
90% of questions will come from this study guide!

1. Lecture notes:

a. Proximate and ultimate causes.

Which ones of the followings are proximate or ultimate causes of behavior: evolutionary history, phylogeny, adaptive function, development, physiological, hormonal and neural mechanism of behavior.

Animal behaviorists assume animal behavior is evolved through natural selection, How is a behavioral trait evolved through natural selection?

b. Learned and innate behavior.

Why (ultimate cause) do animals evolve innate or learned behavior?

What is a releaser (or sign stimulus) and its function?

Most learned behaviors are under the control of genetic (innate) program.

The differences between classical and operant conditioning. Define unconditioned, conditioned stimulus / response.

What is imprinting? The differences between sexual and filial imprinting; examples?

Compare the behavioral and anatomical differences between vocal learning and non-learning species in birds.

Learned behavior always has its genetic basis, innate behavior can be modified by experience (learned), provide examples.

The function of *FoxP2* on vocal learning in birds, mice, and humans.

c. Migration and navigation

Why (ultimate causes) do animals migrate?

Describe Monarch butterfly's multi-generation migration, is it learned or innate behavior?

How (proximate causes) do animal migrate—Sun compass; Star compass, Magnetic field, Olfactory map, Landscape etc. Many animals use a combination of methods to orient their migratory routes. Design experiments to test whether animals can use a specific compass for orientation.

Hippocampus and spatial orientation in animals and humans; why do new neurons grow in hippocampus of London taxi drivers.

d. Foraging behavior

What is echolocation? And what animals use echolocation?

How do honeybee workers communicate with each other to find the location of food resource? how does the waggle dance work?

Honeybees have specialized brain area, specialized hormone, and gene for foraging. Design an experiment to determine the cause and effect between these factors and foraging behavior.

Food storing and hippocampus size. Design an experiment to determine whether the hippocampus may vary in size dependent food storing behavior.

e. Sexual selection

Define two categories of sexual selection: male-male competition and female choice (they are not mutually exclusive).

The fundamental differences between males and females, and how these differences might affect mate choice.

Why sex? What is the benefit/ cost of sexual vs. asexual reproduction?

What is Red-Queen hypothesis, define it and provide an example.

Identify four models of female choice and provide examples. Design experiments to prove or falsify these models. Pay special attention to the good gene hypothesis and sensory bias hypothesis.

What behavioral traits are honest signals? How do you prove that the tail of the peacock is an honest signal?

Male's alternative strategies for male-male competition. What is the benefit and cost of using different strategies?

How does phylogenetic study of animal behavior can tell us about the origin and evolution of behavior?

f. Mating system

Define monogamy, polygyny, polyandry, and promiscuity. Know what is social monogamy.

Under what kind of ecological circumstances different mating system may have evolved?

Why most birds are monogamous, most mammals are polygynous?

Why do many socially monogamous animals often engage in extra-pair copulation? What are the benefit/cost of extra-pair copulation?

The relationship between mating system, parental care, and sexual dimorphism.

Define sperm competition and provide examples. Why do females encourage sperm competition among males?

What are the differences between resource-defense, female-defense, and lek polygyny?

Proximate causes of mating system: what is the role of neurotransmitter (dopamine, vasopressin) on the development and evolution of mating system? How does vasopressin receptor (V1aR) affect the pair bonding behavior?

g. Parental care

Why do males sometimes provide parental care?

Why do many male, not female, fishes provide parental care?

Parent-offspring recognition: Can parental animals always identify their own progeny? Under what kind of social circumstances would animals evolve the ability to identify their own progeny?

2. Reading assignments:
  - a. Tools use in New Caledonian crows. How do New Caledonia crows evolve tool-using behavior?
  - b. FoxP2 gene and speech learning. The function of *FoxP2* in birds, mice, bats, and humans. How do you design an experiment to test the role of a gene, such as FoxP2, on vocal learning behavior.
  - c. Cryptochrome gene: What is the function of cryptochrome gene in fruit fly, in monarch butterfly, and in humans? In this article, how did neural scientists design the experiment to test the possible function of cryptochrome in humans?
  - d. Food caching in scrub jays: What experiments were done in this article to demonstrate the future planning of food caching behavior.
  - e. Red-queen hypothesis: In this article, what experiments or evidence is to support the red-queen hypothesis?
  - f. MHC genes and mate choice. MHC is polymorphic gene, what does it do in human body? And how is the polymorphic MHC gene associated with mate choice?
  - g. The fattest ape. Why do humans are the fattest apes (evolutionary adaptation of producing and maintaining fat tissues)? How is this adaptation associated with evolution of human brains?
  - h. Gay gene: What is the evidence of the genetic basis of homosexuality? What non-genetic factor (biological) may induce homosexual behavior?
  - i. Vasopressin, oxytocin, and mating system. What hormones influence the behavior of pair-bonding or affiliation? Why does social monogamy have been evolved in humans? Human version of V1a receptor gene is associated with what kind of human behavior?

3. Quizzes

A few questions will come from the first 3 quizzes.

4. Textbook

Read the related topics in your textbook should help.

The test will include (1) multiple choices; (2) short answers; (3) short essays.

Go over the materials at least two times (wire-up your synapses) and make good use of your developing brain! Don't hesitate to contact me if you have questions ([liuw@mail.rockefeller.edu](mailto:liuw@mail.rockefeller.edu)). Good luck!